



NOISE ELEMENT

CITY OF EL PASO DE ROBLES
CALIFORNIA

JUNE 1976

envicom

PREFACE

On June 5, 1975, the San Luis Obispo County and Cities Area Planning Coordinating Council authorized Envicom Corporation to proceed with studies for a Regional Noise Element in accordance with a joint powers agreement among the County of San Luis Obispo and the Cities of Arroyo Grande, Grover City, Morro Bay, Paso Robles, Pismo Beach, and San Luis Obispo.

This report in two volumes (Volume One: POLICY REPORT and Volume Two: TECHNICAL REPORT) summarizes work performed by Envicom Corporation and the member jurisdictions of the Area Coordinating Council in preparing the Regional Noise Element. This final documentation of studies has been prepared in accordance with California Government Code Section 65302 (g) and has been designed to be suitable for submission for approval and adoption by the member jurisdictions of the Area Planning Coordinating Council.

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* NOISE CONTOUR MAPS

(* Available through Local Planning Agency)

PROPOSED REVISIONS TO DRAFT NOISE ELEMENT

Change 1 - Page 1.26 - Change Policy 5.0 to read:

- 5.0 Make information on the nature and extent of noise problems in the City readily available to the public.

Change 2 - Page 1.26 - Change Section 1.2 to read:

- 1.2 Develop a noise ordinance setting specific limits for various land uses.

Change 3 - Page 1.26 - Add new section as follows:

- 1.3 Incorporate specific standards contained in the noise ordinance into the performance standards section of the zoning ordinance where appropriate.

Change 4 - Page 1.27 - Add after Section 3.4:

- 3.5 When applicable, incorporate into use permits, conditions which will insure that specific designs or uses are consistent with adopted noise standards.

Change 5 - Page 1.27 - Change Section 4.1 to read as follows:

- 4.1 Amend the Circulation Element of the General Plan to incorporate a system of marked truck routes which will prohibit heavy trucks in areas of noise sensitive land uses.

Change 6 - Page 1.27 - Change Section 4.2 to read as follows:

- 4.2 Support programs to control railroad noise impacts upon the City.

Change 7 - Page 1.27 - Change Section 5.1 to read as follows:

- 5.1 Make the Noise Element and other available data on noise problems readily available to residents through the public library, City Hall and other public facilities. Special attention should be given to making Airport and Public Works employees aware of the hearing damage risk criteria established by OSHA.

Change 8 - Page 1.27 - Change Section 5.2 to read as follows:

- 5.2 Provide developers and builders with available design information to reduce noise levels in new and existing developments. Make noise amelioration a consideration in all subdivision and permit applications.

PROPOSED REVISIONS TO DRAFT NOISE ELEMENT (cont'd)

Change 9 - Page 1.27 - Change Section 6.1 to read as follows:

- 6.1 Encourage the State Department of Transportation (CALTRANS) and the County Engineer to incorporate noise reduction methods in road construction during preliminary discussions on new construction.

Change 10- Page 1.27 - Change Section 6.2 to read as follows:

- 6.2 Coordinate City noise monitoring activities with County and CALTRANS programs.

Change 11- Page 1.27 - Change Section 6.3 to read as follows:

- 6.3 The City Council and the various City Departments should support the use of uniform noise evaluation schemes at all levels of Government.

RESOLUTION NO. 2151

A RESOLUTION OF THE CITY COUNCIL
OF THE CITY OF EL PASO DE ROBLES, STATE OF CALIFORNIA,
APPROVING AND ADOPTING THE NOISE ELEMENT OF THE
GENERAL PLAN FOR THE CITY OF EL PASO DE ROBLES

WHEREAS, the Planning Commission of the City of El Paso de Robles did present to the City Council their recommendation and approval of a Noise Element of the General Plan for the City of El Paso de Robles; and

WHEREAS, pursuant to Government Code Section 65300 et seq., the said Council gave required notice and did hold public hearing on the 18th day of July, 1977, for the purpose of considering the adoption of the Noise Element of the General Plan reports and maps, at which public hearing the Noise Element of the General Plan was explained and reported upon; and

WHEREAS, said element of the General Plan report and maps are necessary for the sound future of community development, the preservation of community and city-wide values and the promotion of general health, safety, convenience and the welfare of the citizens of the City of El Paso de Robles; and

WHEREAS, the Noise Element outlines a comprehensive plan to achieve and maintain a noise environment that is compatible with a variety of human activities in different land uses.

NOW, THEREFORE, BE IT RESOLVED THAT:

1. The City Council does hereby approve and adopt the Noise Element of the General Plan for the City of El Paso de Robles.

2. The City Clerk endorse and file a copy of report and

maps, attesting to this Council's adoption.

PASSED AND ADOPTED this 2nd day of August,
1977, by the following roll call vote:

AYES: Hanson, Hurst, Stemper and Schwartz

NOES: None

ABSENT: Councilman Minshull

Barney Schwartz
BARNEY SCHWARTZ, MAYOR

ATTEST:

Donald B. Keefer
DONALD B. KEEFER, CITY CLERK

STATE OF CALIFORNIA)
COUNTY OF SAN LUIS OBISPO) SS.
CITY OF EL PASO DE ROBLES)

I, Donald B. Keefer, City Clerk of the City of El Paso de Robles, California, do hereby certify that the foregoing Resolution No. 2151 was duly and regularly adopted, passed, and approved by the City Council of the City of El Paso de Robles, California, at a regular meeting of said City Council held at the regular meeting place thereof, on the 2nd day of August, 1977, by the following roll call vote:

AYES: Hanson, Hurst, Stemper and Schwartz

NOES: None

ABSENT: Councilman Minshull

Dated this 3rd day of August, 1977.

Donald B. Keefer
City Clerk and Ex-Officio of the
City Council, City of El Paso de
Robles, State of California.

RESOLUTION NO. 77-02

A RESOLUTION OF THE PLANNING COMMISSION
OF THE CITY OF EL PASO DE ROBLES,
STATE OF CALIFORNIA, APPROVING AND ADOPTING
THE NOISE ELEMENT OF THE GENERAL PLAN
FOR THE CITY OF EL PASO DE ROBLES

WHEREAS the Planning Commission of the City of El Paso de Robles did review the recommendations for the proposed Noise Element of the General Plan for the City of El Paso de Robles; and,

WHEREAS, pursuant to the State of California Government Code Section 65300 et. seq., the said Commission gave required notice and did hold a Public Hearing on the 13th day of June 1977, for the purpose of considering adoption of the Noise Element of the General Plan, at which Public Hearing the Noise Element was explained and reported upon; and,

WHEREAS said Element of the General Plan is necessary for the sound future of community development, the preservation of community- and city-wide values, and the promotion of general health, safety, convenience, and welfare of the citizens of the City of El Paso de Robles;

NOW, THEREFORE, BE IT RESOLVED that:

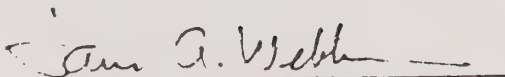
1. The Planning Commission does hereby approve and adopt the Noise Element (as amended) of the General Plan for the City of El Paso de Robles, dated June 13, 1977, and recommends said Plan to the City Council;
2. The Secretary endorse and file a copy of this resolution, attesting to this Planning Commission's adoption; and
3. A certified copy of said Noise Element of the General Plan, with a certified copy of this Resolution, be delivered to the City Council of the City of El Paso de Robles.

APPROVED AND ADOPTED this 13th day of June 1977.



RICHARD L. STURGEON, Chairman
El Paso de Robles City Planning Commission

ATTEST:



JAMES A. WEBBER, Secretary
El Paso de Robles City Planning Commission

**THE NOISE ELEMENT
OF THE
SAN LUIS OBISPO COUNTY GENERAL PLAN**

BOARD OF SUPERVISORS: Hans Heilmann, Chairperson
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June 11, 1976

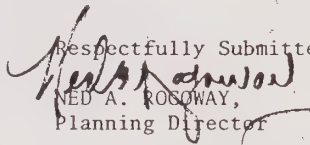
Honorable Board of Supervisors
Honorable Planning Commission
San Luis Obispo County, California

Ladies and Gentlemen:

Submitted herewith is the proposed Noise Element of the General Plan of San Luis Obispo County. The objective of this State-mandated Element is to introduce noise considerations in the planning process. The technical analyses and policy recommendations contained herein are intended as a guide for public officials and private citizens in matters relative to noise concerns in San Luis Obispo County.

We wish to express our appreciation to ENVICOM Corporation for their forthright and cooperative effort in preparing this document. Appreciation is also extended to the County and Cities Area Planning Coordinating Council and to the many other units of government; Federal, State and local who assisted in the collection and preparation of data summarized herein.

Finally, we gratefully acknowledge the foresightedness of your Honorable Bodies in authorizing its preparation and supporting its completion. It is our hope that you will accept this Noise Element and incorporate it into County Policy.

Respectfully Submitted,

NED A. ROGOWAY,
Planning Director

NAR:ek

POLICY REPORT

ACKNOWLEDGEMENTS

This Noise Element was prepared for the San Luis Obispo County and Cities Area Coordinating Council. The staff of Envicom Corporation wish to acknowledge the cooperation and invaluable assistance extended to them during this study by the administrative staff of the County and City governments, especially:

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I. INTRODUCTION

A. Legislative Authority

In making city and county governments in California responsible for a Noise Element in their General Plans, the Legislature has recognized the steady escalation of outdoor noise as a significant environmental hazard. Unlike other hazards faced by California residents, such as earthquakes or floods, noise is generated primarily by man's own activities. Considering noise in the planning process, then, is essential to controlling its impact on the community. Specific authority for this Element of the General Plan is contained in Government Code Section 65302(g), which requires the following:

(g) A noise element in quantitative, numerical terms, showing contours of present and projected noise levels associated with all existing and proposed major transportation elements. These include but are not limited to the following:

- (1) Highways and freeways,
- (2) Ground rapid transit systems,
- (3) Ground facilities associated with all airports operating under a permit from the State Department of Aeronautics.

These noise contours may be expressed in any standard acoustical scale which includes both the magnitude of noise and frequency of its occurrence. The recommended scale is sound level A, as measured with the A-weighting network of a standard sound level meter, with corrections added for the time duration per event and the total number of events per 24-hour period.

Noise contours shall be shown in minimum increments of five decibels and shall be continued down to 65 dB(A). For regions involving hospitals, rest homes, long-term medical or mental care, or outdoor recreational areas, the contours shall be continued down to 45 dB(A).

Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the General Plan.

The state, local, or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan a statement of the present and projected noise levels of the facility, and any information which was used in the development of such levels.

B. Purpose and Approach

As a mandated part of the General Plan, the Noise Element is intended to serve as the local government's guide in public and private development matters related to outdoor noise. The basic goal of the Element is to outline a comprehensive plan to achieve and maintain a noise environment that is compatible with a variety of human activities in different land uses. To achieve this goal, the Element provides a quantitative estimate of noise exposures, land use noise standards, and recommended policies for controlling noise. This information is intended for use in conjunction with other adopted policies of the General Plan, particularly those of the Circulation, Land Use, and Housing Elements.

This Regional Noise Element has been prepared in two volumes for the Area Planning Council. The first volume, the Policy Report, is concerned with the implications of the technical findings for noise control. The second volume, the Technical Report, contains the quantitative

estimates of existing and forecasted noise levels in the Cities and County, and documents the methods used in computing noise exposure. Together, these two volumes constitute the Noise Element.

The reports have been designed for adoption by the County of San Luis Obispo and all of the incorporated cities within the County. The heart of the Element is in the recommended goals, policies, and implementation measures. This section of the Policy Report is therefore organized into chapters by jurisdiction. Each City and the County would then adopt its own policy statement, the preliminary sections of this Policy Report, and the Technical Report. It is intended that once adopted, the Noise Element will be updated on a regular basis.

C. Relationship to Other General Plan Elements

The Noise Element is most closely related to the Circulation, Land Use, and Housing Elements. The principal noise sources evaluated in the Element are transportation noise sources, which are road, rail and air traffic. Noise generated by these sources depends primarily on the number and type of vehicles in operation as planned for in the Circulation Element.

Inseparable from the circulation considerations in the General Plan are the locations and types of land uses throughout the County. The locations of circulation routes in relation to different land uses can be a major determining factor of noise exposure. It is important that consideration be given in the Land Use Element and all community general plans to separating the most noise sensitive land uses from the sources of high noise levels. Land use noise standards are recommended as a part of this Element to assist in these considerations.

The Housing Element is related to the Noise Element in that both the location and insulation requirements of housing are, in part, determined by noise exposures.

The status of the Circulation, Land Use, and Housing Elements of the General Plans of member jurisdictions of the Area Planning Coordinating Council varies from jurisdiction to jurisdiction. Some elements are fairly old, others are recently adopted, and others are in preparation at this time. For those jurisdictions with adopted elements, it is recommended that those elements be reviewed to incorporate this Noise Element. For those jurisdictions whole elements are in preparation, it is recommended that the Noise Element be incorporated into them while under preparation.

II. NOISE EXPOSURE

A. General

The existing and forecasted noise levels in San Luis Obispo County are presented in the Technical Report in both graphic form on the Noise Contours Maps and tabular form in Appendix C of that volume. These noise levels are expressed in A-weighted decibels in terms of Day-Night Noise Levels (abbreviated L_{dn}). Detailed explanations of L_{dn} noise levels and the methods used to compute them are presented in the Technical Report. The following brief discussion is intended to provide a basic understanding of the terms to facilitate use of the Noise Contours Maps and Appendix C. Appendix A of the Technical Report provides a glossary with additional discussion of some of the more technical language.

Common noises experienced by each of us daily may range from a whisper to a locomotive train passing by. The range of sound energy represented by these two events is so large that it cannot be represented mathematically without using numbers in the millions and billions. To avoid this inconvenience, sound levels have been compressed in a standard logarithmic scale called the decibel (dB) scale. The reference level for the scale, 0 dB, is not the absence of sound, but the weakest sound a person with very good hearing can detect in a quiet place. The most important feature of the decibel scale is its logarithmic nature. An increase from 0 to 10 dB represents a tenfold increase in sound energy, but an increase from 10 to 20 dB represents a hundred fold increase, and from 20 to 30 represents a thousand fold increase over 0 dB.

The average range of sounds that we are commonly exposed to generally fall in the 30 to 100 dB range. However, not all sound waves affect us equally. The human ear is more sensitive to high pitch sounds, such as a whistle, than it is to low pitch sounds, such as a drumbeat.

To account for this effect in noise measurements, it is necessary to use an electronic filter in sound level meters which acts as the equivalent of the human ear in filtering out some of the lower frequencies of sound. This filter is called the A-scale weighting network, and is abbreviated by the A in the notation dBA.

A-scale decibel measurements can be taken at any time in the community to record the sound levels of various noise sources. However, to develop an indicator of varying sound levels occurring over the 24-hour day, it is necessary to average the sound occurring at each moment throughout the day. The Day-Night Noise Level is the result of this procedure, and gives a general, single-number index of noise exposure over an average 24-hour day. In computing the L_{dn} levels, it is also necessary to apply a weighting to noise that occurs at night to account for the greater sensitivity that people have to noise at night. L_{dn} noise levels can be developed for road traffic, as well as for rail and air traffic for which the measure has been used traditionally. As examples of typical L_{dn} noise level ranges, Figure 1 gives ranges of L_{dn} decibel exposures ranging from quiet rural areas to an area under the flight path of a major airport.

B. Existing Conditions

The existing noise environments in San Luis Obispo County and the Cities within the County are composed of sounds from many sources. Under the scope of this Element, the noise sources evaluated were road, rail, and air traffic, and stationary noise sources. Parks, schools, and hospitals were also evaluated as noise sensitive land uses to determine if potentially incompatible noise levels impinged on them. The following are summary conclusions regarding the existing noise environment in the County and Cities:

1. In general, San Luis Obispo County may be considered a relatively quiet environment even within most of its Cities and unincorporated urban areas. In all jurisdictions

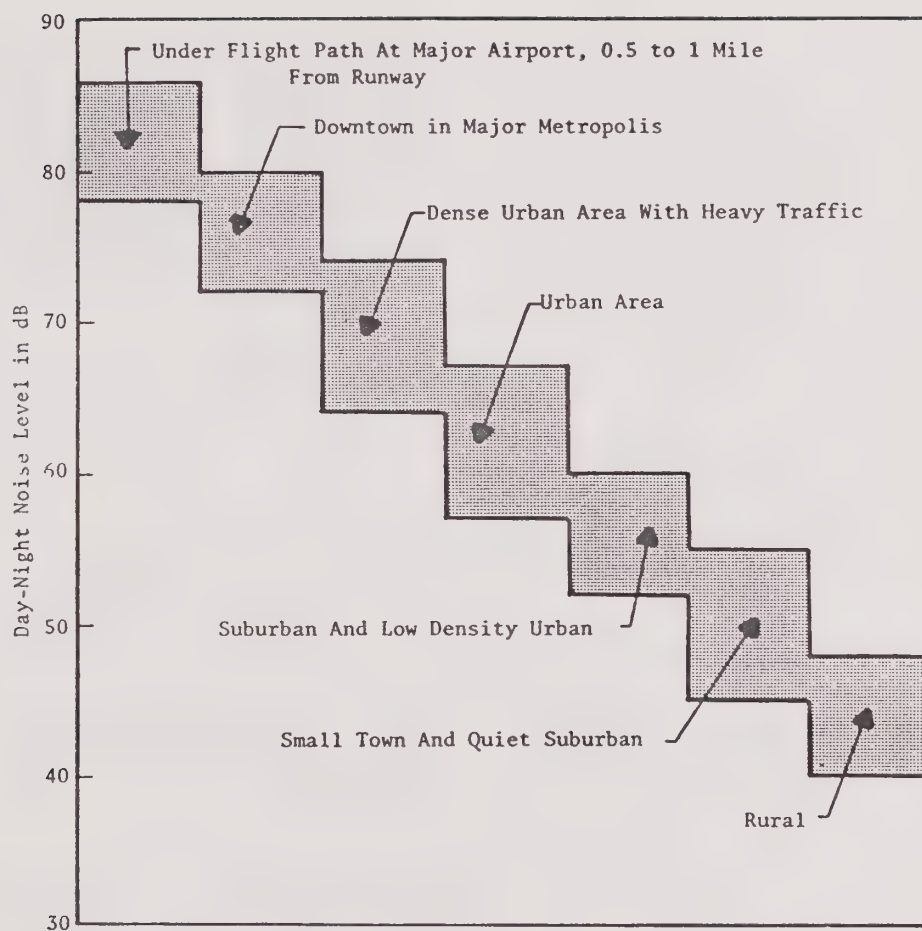


Figure 1
TYPICAL L_{dn} NOISE LEVEL RANGES
(Source: Bolt, Beranek, and Newman, Inc., 1974)

1.4 A

within the County, 14 potential noise conflict areas were identified from a list of 115 possible problem areas. Of 140 possible stationary noise sources investigated, 10 were identified as major noise sources. Of hundreds of road segments evaluated for traffic noise, segments on five principal roadways were associated with high noise levels. This is not to say that the County is without noise problems. Rather, the major noise sources are few in number and of limited impact.

2. The most significant sources of noise in the County is road traffic, followed by rail and air traffic. Stationary noise sources were not found to be significant sources of noise within the County.

3. Of the roads evaluated for noise exposure, the following were found to be associated with high noise levels: U S 101, State Highways 1, 41, 46, 227, El Camino Real in Atascadero, Spring Street and 24th Street in Paso Robles, Morro Bay Boulevard in Morro Bay, Grand Avenue in Grover City, Grand Avenue and Valley Road in Arroyo Grande, and the following roads in the City of San Luis Obispo: Madonna Road, Foothill Boulevard, Santa Rosa Street, Monterey Street, and Johnson Avenue.

4. Rail traffic on the Southern Pacific line is infrequent, but creates intense noise events such that the total sound energy associated with the railroad is nearly equivalent to that of U S 101. Urban areas impacted by railroad noise include the City of Paso Robles, Atascadero, the City of San Luis Obispo, the City of Pismo Beach, Grover City, and Oceano.

5. The three public airports in the County are significant sources of local noise. However, under existing conditions, high noise levels (i.e. 65dBA CNEL or higher) are limited to airport property.

6. Table 1 contains a list of those noise sensitive land uses which were found to be exposed to potentially incompatible noise levels according to the land use standards recommended in this Policy Report. The incompatibility is termed potential because the land use was evaluated only at a general level. Site acoustic analysis is necessary to determine the nature and extent of a noise problem, should one be confirmed to exist. Sources of the noise impinging on the land use or facility are also listed.

Table 1. Potential Noise Conflict Areas

<u>Jurisdiction</u>	<u>Noise Sensitive Area</u>	<u>Local Noise Source</u>
City of San Luis Obispo	French Hospital	Johnson Avenue Southern Pacific Railroad
	County Hospital	Johnson Avenue
	Laguna Lake Park Site	Madonna Road
	Sinsheimer Park	Southern Pacific Railroad
City of Paso Robles	San Luis Obispo Senior and Junior High Schools	Southern Pacific Railroad
	Pioneer Park	U S 101 Southern Pacific Railroad
	Robbins Field Ball Park	Southern Pacific Railroad

Table 1 (Continued)

<u>Jurisdiction</u>	<u>Noise Sensitive Area</u>	<u>Local Noise Source</u>
City of Morro Bay	Lila H. Keiser Pk. Morro Bay Rest Home	State Highway 1 State Highway 1
City of Pismo Beach	North Beach Camp-ground Pismo Creek Park	State Highway 1 U.S. 101 Southern Pacific Railroad
City of Arroyo Grande	El Camino Wayside Pk. Dower Park	U.S. 101 U.S. 101

C. Future Conditions

In planning for noise control, it is necessary to estimate what the future noise environment may be like. Accordingly, noise level forecasts for the year 1995 were included as part of the technical analysis. In general, the future noise environment will be controlled by two factors:

1. The expected increase in the number of noise sources (i.e. traffic volumes), and
2. the application of noise control technology to various sources.

It is reasonable to assume that noise control technology will be applied to some noise sources, and that this will

6. Table 1 contains a list of those noise sensitive land uses which were found to be exposed to potentially incompatible noise levels according to the land use standards recommended in this Policy Report. The incompatibility is termed potential because the land use was evaluated only at a general level. Site acoustic analysis is necessary to determine the nature and extent of a noise problem, should one be confirmed to exist. Sources of the noise impinging on the land use or facility are also listed.

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Table 1 (Continued)

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City of Arroyo Grande	El Camino Wayside Pk. Dower Park	U.S. 101 U.S. 101

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1. The expected increase in the number of noise sources (i.e. traffic volumes), and
2. the application of noise control technology to various sources.

It is reasonable to assume that noise control technology will be applied to some noise sources, and that this will

counterbalance the increase in traffic, resulting in the same noise levels as currently exist or in decreased noise levels. No major technological breakthrough is foreseen for other noise sources, however, such as light aircraft, and the expected increase in volumes of these sources will mean an increase in noise levels. Even with the application of technology, high noise levels are expected to persist in some areas of the County. There are limits to what can be accomplished by technology alone, and this makes land use control a necessary component of successful noise control strategies. Summary conclusions regarding the expected future noise environment are as follows:

1. Forecasts of road traffic noise assume that noise control technology will be applied, and that this will counteract the expected increase in road traffic in most, but not all, cases. Thus road traffic noise is projected to remain the same or decrease somewhat by 1995 on most roads.
2. The future of the railroad is in a state of flux at this time, making the task of quantitative noise projection impractical. Current noise levels are assumed to persist for at least the intermediate future.
3. No major technological breakthrough is foreseen which will significantly reduce the noise emissions of reciprocating engine aircraft. Noise levels around the three public airports are, therefore, expected to increase in the forecast year due to increases in traffic. However, even these increased noise levels will not significantly affect land outside the airport property except in the case of San Luis Obispo Airport.
4. Stationary noise sources are expected to continue to emit existing noise levels unless abatement is required by local or federal agencies.

D. Effects of Noise

1. General

Noise affects man and his environment in a number of important ways. Some sounds cannot be heard or are not noticed, yet the human body reacts involuntarily to them. Other sounds are intense and quick enough to rupture the eardrum. However, all sound is not destructive. The point should be emphasized that sound is vital to communication and necessary for the maintenance of life.

As sound levels increase, they quickly reach levels which can be detrimental to health and well-being. However, like most human characteristics such as eye color and vision acuity, hearing ability is distributed "normally" in a population. That is, there are a few people with extremely sensitive hearing, and a few people with extremely poor hearing ability. Most people, however, have hearing abilities between these extremes. This is an important concept to remember while reading the following sections on the effects of noise. Not all people are subject to experiencing these effects to the same degree. In short, the effects of noise are subjective, and this has an important bearing on regulatory schemes enacted by governments which set noise standards.

The effects of noise may be thought of as falling into four categories: physical, psychological, social, and economic. The lines between the categories are not established; there is much overlap. As research in acoustics and human response to sound progresses, the effects of noise will be more completely defined. This discussion is intended to be a brief summary of existing knowledge.

2. Physical

The most serious physical effect of noise is damage to

hearing, and the most tragic damage to hearing is a permanent shift in the hearing threshold (termed permanent threshold shift or PTS). Once the cells of the inner ear are ruptured or otherwise damaged, there is no known way to repair them. The cells do not regenerate. To persons intermittently exposed to high noise levels, the hearing threshold may be shifted temporarily (termed temporary threshold shift or TTS). Most of us have experienced TTS at sometime, for example, when a firecracker explodes or a loud, sharp noise occurs nearby. For awhile, we cannot hear sounds at lower intensities. While the ear eventually recovers from this kind of damage, TTS can be a significant problem to persons frequently exposed to noise.

Besides the physical effect on our hearing, noise can induce a number of other physiological reactions. In fact, environmental or community noise is of concern not so much because of its effects on hearing, but because of its non-auditory effects. Community noise, particularly in a predominantly rural area such as San Luis Obispo County, is usually not intense enough to affect hearing. Table 2 is a summary of the noise level criteria, based on hearing loss, established by the Walsh-Healey Public Contracts Act of 1969 and the Occupational Safety and Health Act of 1970 (OSHA). These criteria are intended to regulate noise levels in industrial settings where people are exposed on a daily basis over a lifetime. To experience the 90 dBA criterion from road traffic, a person would have to stand 10 to 20 feet from a highway carrying about 1000 trucks per hour. To meet the OSHA criteria, the person would have to remain there 8 hours a day for a period of at least several years. Such a situation is highly improbable (even with the expected 5 dBA reduction in the OSHA criteria) and indicates that few, if any, people in San Luis Obispo County are exposed to noise levels from transportation sources that can significantly damage hearing.

Table 2. Hearing Damage Risk Criteria

<u>Duration per day, hours</u>	<u>Sound level, dBA</u>
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

Source: Walsh-Healy Public Contracts Act of 1969

Perhaps the most important effects of community noise, then, are its effects related to stress. Noise is one of the principal urban stresses experienced daily by urban dwellers. The body interprets noise as a form of stress and reacts accordingly. Most of the responses are automatically produced by the involuntary nervous system. The individual may not be consciously aware that his body is under stress, and that nervous reactions are occurring. Furthermore, the individual may not be aware that noise is the source of stress even if he was aware of the stress in the first place. Reactions to noise are similar to reactions to intense emotional states such as fear or anger. Some of the responses are (1) an increase in blood pressure, (2) an increase in heart rate, (3) dilation of the pupils, (4) increase in blood cholesterol, (5) increase in hormone levels by endocrine glands, (6) change in the rate of acid secretion by the stomach, (7) increase in sweat gland activity, and (8) increase in respiration. These responses can lead to increases in heart disease, ulcers, tension, hypertension, and allergic reactions. It has been documented that noise affects us even in the womb

before birth. Even relatively low levels of noise in the mother's environment can cause the fetus' heart rate to increase significantly. Other research concludes that very loud noises can possibly be as much a cause of congenital malformations as thalidomide or German measles. On a less serious level, noise can be responsible for the headaches and daily fatigue common in urban areas. Noise may affect our health adversely only if we are exposed to high levels for long periods of time, but it can impair our well-being through the kind of effects listed above at levels commonly experienced in urban areas.

The effects of noise discussed above are produced by sounds in the audible frequency range. Mention should also be made of two categories of sound which cannot be heard - "ultrasonics" and "infrasonics". Ultrasonics refers to the range of sounds above 20,000 Hertz or wave cycles per second, the upper limit of human hearing. A dog whistle is a common example of a device which produces ultrasonic frequencies. Infrasonics, on the other hand, refers to frequencies below the audible range, that is, below 16 Hertz.

For years, ultrasound has been used in medicine to treat asthma, cystic fibrosis, and other respiratory ailments, and in a variety of ways to clean small instruments, jewelery, tools, dentures, etc. Useful and common as ultrasound is, it is known to be hazardous if improperly applied. It specifically should not be directed at areas of poor blood circulation or cancerous infection. The presence of ultrasound in the ambient urban atmosphere is generally insignificant compared to audible frequencies, but it should be noted as a potential health hazard.

Infrasound is less familiar to most people, and research into the world of infrasonics is relatively

recent. These low frequency pressure waves seem mostly to act on the internal organs - the heart, lungs, and viscera - by vibrating them. The organs are rubbed together by a kind of resonance creating dizziness, nervous fatigue, and seasickness. A frequency of 7 Hz. has been found to be fatal at high enough intensities. Infrasound has been measured in the everyday ambient atmosphere in Washington D.C. Some of the sources were identified as large scale natural events such as tornadoes in Oklahoma, an earthquake in Montana, and magnetic storms in the upper atmosphere. A large number of sources remain unidentified, however. One common source of infrasound are large industrial ventilation systems. More so than ultrasound, infrasound can be considered part of the urban environment.

Noise affects animal behavior in ways similar to human behavior. Little research has been done in this field, especially on wild animals, but there are strong indications that unfamiliar noises can disrupt population dynamics and individual growth behavior. A single startle can stop the brooding cycle of wild game birds. Continuous noise can mask predator-prey signals inducing huddling, panic, or migration. Animal ears are subject to similar kinds of physical damage as human ears. Loss of hearing because of noise exposure has been documented in a number of laboratory cases with a variety of species. Animals also react to noise as stress which produces neural and hormonal changes affecting urinary, adrenal, and reproductive functions.

In the wild, these effects can significantly alter the "natural balance" between various species and between species and their environment. An animal which depends on hearing to locate prey could starve if its auditory function was impaired. Mating signals could be interfered with, and distress signals may be masked by background noise. All of these effects can lead to increased mortality rates.

1.8B

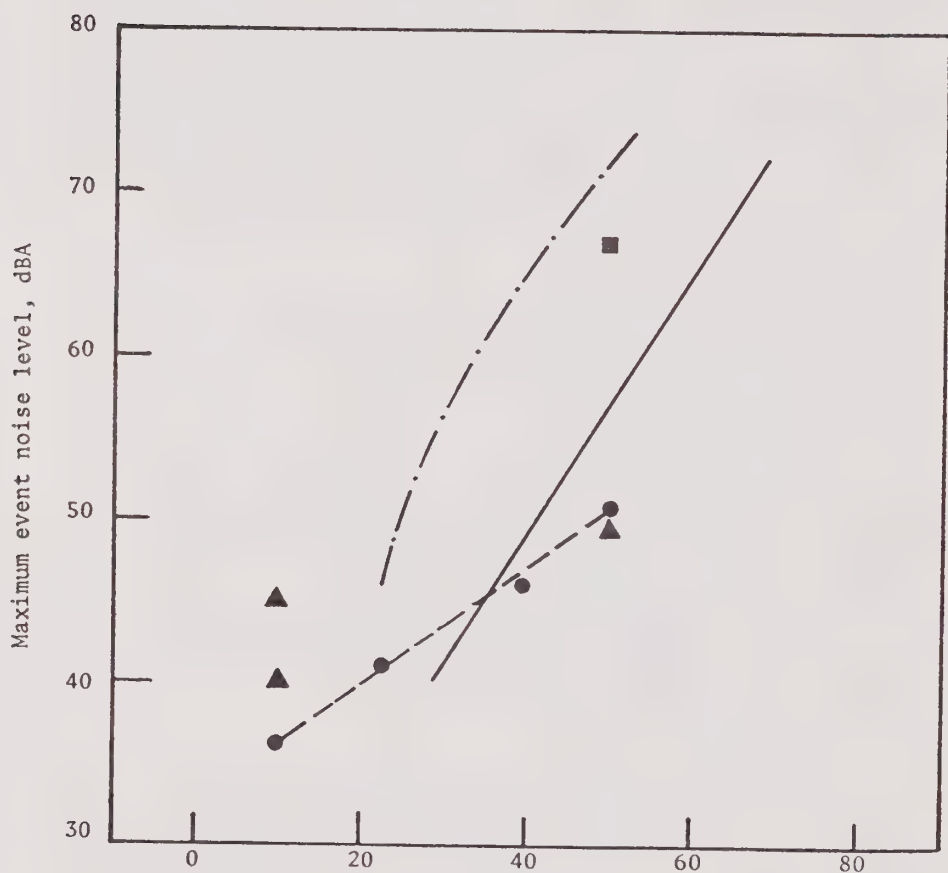
Domestic animals may suffer more since they are usually closer to urban areas. Farm animal productivity may be diminished, and mortality rates can be increased as well. The economic impact of these effects would make further study in this area worthwhile. The point to be made is that noise impacts the animal population in San Luis Obispo County, as well as the human population. It should also be noted that animal populations have adverse reactions primarily to unfamiliar noises. Animals demonstrate an ability to adapt to a noise over time if it is learned that the noise is not associated with direct harm.

Noise also affects the non-living physical environment in the City. The example of high pitched sound resonating and shattering glass is common. Structural damage by noise is usually moderate, however, even in sonic booms. Glass and plastic are generally the materials most susceptible to damage by noise. Others include base coats of paint, finish coats, stucco, wallboards, interior tiles, brick, concrete blocks, and organic adhesives. Temporary vibrations may be induced in various kinds of structures, particularly buildings, by noise as well. Structural response to sound is highly variable, however, and most damage is usually concentrated in secondary structures such as glass or plaster.

3. Psychological

It is difficult to distinguish between physical and psychological effects of noise. Many of the behavioral responses to noise are rooted in the involuntary physiological reactions. The two most serious psychological effects of noise are interference with sleep and speech. Data on interference with sleep shows that this response is more subjective than interference with speech, but generally noise levels will begin to interrupt or impair sleep in the 40 to 45 dBA range (Figure 2). Noise acts on the body when it is asleep in the same manner as it does when the person is awake. The ear does not mask noise during sleep. Even if noise levels do not awaken

Figure 2. Noise-induced sleep disturbance data.
(Source: Wyle Laboratories, 1973)



Percentage of persons awakened or shifted to a shallower sleep stage (experiments), or who report sleep disturbance (surveys).

Explanation

- — ● Laboratory experiment on subject awakenings.
- ▲ Laboratory experiment on change of sleep level.
- Laboratory experiment subject awakenings.
- . — Field survey data. People reported being kept from going to sleep.
- Field survey data. People reported being awakened.

a person, they can interfere with dream stages shifting a person from a deeper dream stage to a shallower one. Any disruption of deep stage dreaming is thought to impair mental health and well-being. Loss of sleep is known to impair a person's ability to carry on normal daily tasks, especially those requiring short term memory or high speed processing of information. Severe deprivation of sleep can create irascibility and mental disorganization causing dreaming while awake, hallucinations, and other behavior bordering on temporary mental illness. It is important to remember that noise can disturb the rest of sleeping persons whether they awaken or are aware of the noise or not.

Interference with speech depends, of course, on how far the people are from each other, the level of their voices and other parameters. The understandable reception of voice sounds in ordinary conversation is usually interfered with at the level of 50 to 60 dBA (Figure 3). The social costs of interference with speech can be of great magnitude and are discussed below. The behavioral impacts of speech interference include impairment of leisure activities needed for stable human behavior, and irritability when conversations must stop until the noise decreases. Noise also interferes with concentration and the ability to perform tasks.

While it has never been proven that exposure to noise alone can cause mental illness or breakdown, it is true that exposing a depressed individual to noise doesn't help. A famous English study reported in 1969 that individuals closely exposed to the noise of London's Heathrow Airport had higher admission rates to mental hospitals than people living farther from the noise. Such evidence is not entirely convincing, but does warrant further investigation. It is a good indication that noise, as an additional form of unwanted stress, can provide the increment to bring on emotional crises.

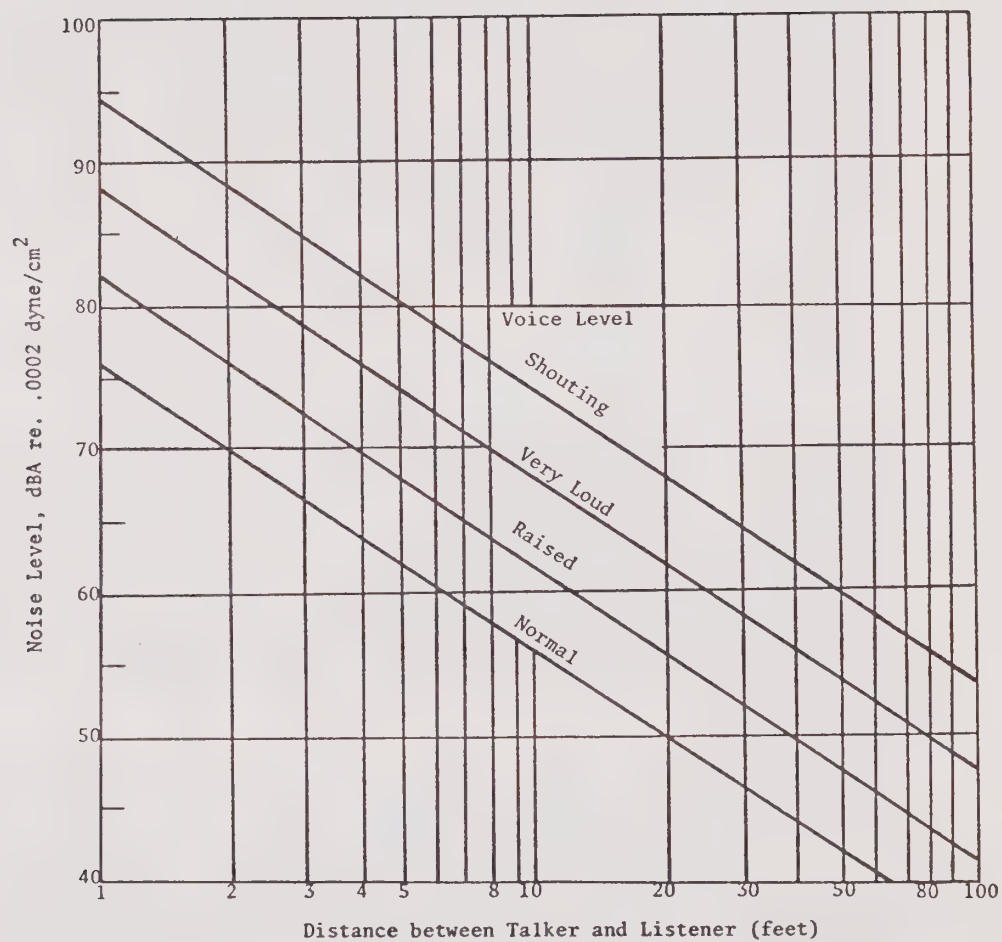


Figure 3. Noise levels which barely permit face-to-face conversation at the indicated distances (Source: Wyle Laboratories: 1973).

1.10 B

4. Social

The reactions of groups and communities to noise are similar to the reactions of individuals. It is clear that noise interferes with social processes. Its foremost effect is to disrupt the ability of people to communicate with one another. Communication by sound is vital to almost all human social behavior, and its impairment should not be underestimated. As an important example, consider educational processes. Children who attend school near sources of loud noise can have their learning and socialization processes severely handicapped. Several schools in Westchester were forced to close down because the noise near the Los Angeles International Airport interfered so seriously with teaching. The effects of noise on other social processes such as marketing, recreation, and the practice of religion can be equally as serious.

5. Economic

One of the more prevalent economic effects of noise of concern to San Luis Obispo is the reduction of residential property values near the source of noise. This document does not examine specific property values in any of the member jurisdictions of the Area Planning Coordinating Council, but a comparison of residential property values near the railroad or U S 101 with residential property located away from these sources may bear this out.

One other kind of major economic cost of noise is noise-induced inefficiency in the labor force. As noted under psychological effects, noise interferes with the performance of tasks. Such interference causes business and industry to lose income through lost output. At the national level, such losses total millions of dollars daily. Occupational noise yearly results in hundreds of millions of dollars of compensation claims, and the

costs of insulating environments and muffling sources should be included as economic costs as well. Economic costs of noise are among the most difficult to calculate, however, because they are associated with the psychological states of stress discussed above. The effects of these states have yet to be adequately quantified by economists.

6. Local Effects in San Luis Obispo County

It is important to ask whether any of the effects discussed above are occurring locally in any of the member jurisdictions in San Luis Obispo County. Since a specific study of this nature has not been conducted as a part of the Noise Element, it is difficult to give a precise answer. However, health and welfare criteria have been published by the federal Environmental Protection Agency, and these criteria can be compared to the noise levels quantified in this Element to draw some general conclusions.

The basic criteria are given in Table 3, and utilize the Sound Equivalent Level (L_{eq}) and Day-Night Noise Level (L_{dn}). The L_{eq} is the basis for the L_{dn} noise level, but does not include a weighting for nighttime noise. It should be noted also that an "adequate margin of safety" has been built into these criteria.

Table 3

SUMMARY OF NOISE LEVELS IDENTIFIED AS REQUISITE
TO PROTECT PUBLIC HEALTH AND WELFARE WITH AN
ADEQUATE MARGIN OF SAFETY

(Source: US Environmental Protection Agency, 1974)

EFFECT	LEVEL	AREA
Hearing Loss	$L_{eq}(24) \leq 70$ dB	All areas
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq}(24) \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{dn} \leq 45$ dB	Indoor residential areas.
	$L_{eq}(24) \leq 45$ dB	Other indoor areas with human activities such as schools, etc.

Explanation

$L_{eq}(24)$ - Equivalent A-weighted Sound Level over 24-hour period.

L_{dn} - Day-Night average sound level - the 24-hour A-weighted Equivalent Sound Level, with 10 decibel penalty applied to nighttime levels.

dB - decibels.

Judging by these criteria and the noise levels quantified in the Technical Report, most of San Luis Obispo County and the Cities within the County are free of the effects of noise. Near the major roads, the railroad, and the airports, however, these criteria indicate that a certain level of activity (i.e. sleep, speech) interference and stress can be expected. As noted in a previous section, it is unlikely that any resident's hearing is threatened unless he is spending unusually long periods of time in close proximity to the major highways.

III. NOISE CONTROL

A. Noise Regulations

Heightened concern in recent years for "environmental quality" has led to greater attention by the legislative and administrative branches of government to the problem of excessive noise. This attention has resulted in the enactment of a number of laws and regulations regarding noise. To provide the legal and planning contexts within which the recommended goals and policies of the Element would be implemented, this section summarizes the current noise laws and outlines possible noise control strategies.

Unfortunately, there has been little coordination among the agencies responsible for noise control, and this has resulted in the use of different noise evaluation techniques and standards in noise regulations. This non-uniform approach makes comparison and use of standards and regulations a confusing matter for both the general public and those government officials responsible for compliance at the local level. Table 4 provides a summary list of existing noise regulations which pertain to the member jurisdictions of the Area Planning Coordinating Council. In addition to those laws shown in the table, both the National Environmental Protection Act (NEPA) and the California Environmental Quality Act (CEQA) require environmental analysis of certain developments including an analysis of potential noise problems at the project site.

The most significant of the laws listed in Table 4 is the Noise Control Act of 1972. This law essentially authorizes the EPA to coordinate noise regulation at the national level. It also authorizes the EPA to set noise emission limits for major noise sources including aircraft, motor vehicles, and trains. These emission standards can be expected to have an important effect on future noise levels in the County. In addition, health and welfare criteria for noise

TABLE 4
(Continued)

Responsible Agency	Regulation/Standard	Noise Source Regulated	Summary
Commission of Housing and Commu- nity Development	California Administra- tive Code, Title 25, Article 4	Outdoor/Indoor noise environments	Limits interior noise levels resulting from outdoor levels in new multi- family units.
Council on Inter- governmental Rela- tions	California Government Code, Section 65302(g)	Outdoor noise environ- ment	Requires quantitative Noise Elements in all City and County General Plans.

Generally, noise control strategies may be thought of as belonging to one of three approaches. From least restrictive to most restrictive, these strategies are: (1) to encourage voluntary noise reduction measures by property owners and developers, (2) require noise reduction or compatible land use through zoning and planning powers, and (3) enact noise control through government ownership of the affected property.

The first approach would include providing information to builders and the general public regarding the importance of noise reduction and different construction and site development techniques for noise compatibility. Various means of achieving this objective include review of proposals by an architectural review board, design services by government staff during the permit application process, and maintenance of an acoustical information library for developers and the public. Education of the public is an important aspect of this approach since public awareness of noise problems can affect the marketability of developments. Such an approach can be successful in solving noise problems provided there is a degree of cooperation between the local government and developers or if the development market is a buyer's market and there is a demand for noise compatibility.

If these conditions do not exist, it may be necessary to use the local government police powers of zoning and planning to ensure that the public is protected from excessive noise. These measures can be an important influence on future development, but may be of little help in resolving existing noise problems. The basic approach is the exclusion of noise sensitive land uses from areas of high noise levels. If development is permitted in noise-impacted areas, zoning performance and development standards can regulate the details of the development such as building height, buffer areas, and noise barrier construction. Special types of development, such as cluster housing and planned unit developments, can be regulated to prevent

unnecessary noise problems from occurring. Building codes may be enforced under this approach as well to limit the transmission of sound into and out of buildings. One concept being implemented in a number of cities in California and across the US is the adoption and enforcement of a noise ordinance which sets quantitative limits on the level of noise permitted in different zones in the City.

Short of purchasing land, the local government can also use tax incentives to regulate land development to a certain degree. This is a potentially powerful land use control which can reduce development pressure on vacant land. The basic technique is to reduce the assessed value of land in noise impacted areas so that landowners are not pressured into selling land they can no longer afford to pay taxes on. This approach has been used in California to preserve open agricultural land under the Williamson Act with varying degrees of success.

Government ownership of noise-impacted land makes the regulation of its use a simpler matter, but the acquisition of the property can be expensive and unpopular locally if eminent domain is used. Purchase or the use of eminent domain powers can be avoided through purchase of an easement regulating the land without transfer of ownership.

Which of these three approaches is used, depends in large measure on the severity of the noise problem. The Technical Report of this Element concludes that, for the most part, San Luis Obispo County is free from excessive noise levels from rail and road traffic except in close proximity to certain major sources such as US 101 and the Southern Pacific railroad tracks. It is unlikely, then, that the local governments need to consider the most restrictive approach, and can rely on zoning and planning to prevent major noise problems from occurring near these sources.

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All of the above strategies deal primarily with reducing future noise problems rather than existing ones. Where a noise problem already exists, one or more of five solutions are available: (1) the noise can be reduced at the source, (2) the noise can be blocked by an insulating barrier, (3) the source can be removed from people and other receivers, (4) the receiver can be removed from the source, or (5) the time exposure to the noise can be minimized. As is true with most environmental hazards, preventing or reducing the cost of the future hazard is easier and less expensive than resolving existing problems. Special ordinances can be adopted, however, which set noise limits by land use zones, and which require compliance by existing developments. One of the central problems of setting noise limits by zone is the number of desirable exceptions to the established noise limit.

IV. GOAL AND POLICY RECOMMENDATIONS













































A. Organization of Recommendations

The previous sections of this report provide a summary of the technical analysis of noise in San Luis Obispo County, and a synthesis of the legal and planning frameworks for noise control. In this section, general planning goals and policies are recommended for each of the member jurisdictions. These recommendations constitute the noise control plan of the County and Cities, and are the heart of the Noise Element. They have been organized by jurisdiction for purposes of the adoption process in the County and Cities.

The recommendations comprise a general planning goal, general policies, and more specific policies termed implementation measures. The general goal provides a statement of the basic purpose of the Noise Element so that consistent planning is possible. It is a necessary guideline which can be held up against future proposals to determine their effect on the noise environment. The general policies complement the planning goal and define specific directions for jurisdictions to take in controlling noise. The implementation measures are a refinement of the general policies, and recommend specific actions for carrying out those policies.

While it would be desirable to fully implement each of the recommended policies and implementation measures, it is recognized that unlimited resources to that end are not available. To aid in determining priorities for the allocation of resources in the community, the recommendations are listed below in their general order of importance to achieving the goal of the Element.

Figure 4.
LAND USE COMPATIBILITY GUIDELINES

LAND USE CATEGORY	Maximum Interior Exposure, Ldn*	LAND USE INTERPRETATION FOR Ldn VALUE			
		55	65	75	85
Residential - Single Family, Duplex, Mobile Homes	45				
Residential - Multiple Family, Dormitories, etc.	45				
Transient Lodging	45				
School Classrooms, Libraries, Churches	45				
Hospitals, Nursing Homes	45				
Auditoriums, Concert Halls, Music Shells	35				
Sports Arenas, Outdoor Spectator Sports					
Playgrounds, Neighborhood Parks					
Golf Courses, Riding Stables, Water Rec., Cemeteries					
Office Buildings, Personal, Business and Professional	50				
Commercial - Retail, Movie Theaters, Restaurants	50				
Commercial - Wholesale, Some Retail, Ind., Mfg., Util.					
Manufacturing, Communications (Noise Sensitive)					
Livestock Farming, Animal Breeding					
Agriculture (except Livestock), Mining, Fishing					
Public Right-of-Way					
Extensive Natural Recreation Areas					

*Due to exterior sources
(Source: Bolt, Beranek, and Newman, Inc., 1974)

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EXPLANATION
FOR
FIGURE 4



CLEARLY ACCEPTABLE:

The noise exposure is such that the activities associated with the land use may be carried out with essentially no interference.
(Residential areas: both indoor and outdoor noise environments are pleasant.)

NORMALLY ACCEPTABLE:

The noise exposure is great enough to be of some concern, but common constructions will make the indoor environment acceptable, even for sleeping quarters. (Residential areas: the outdoor environment will be reasonably pleasant for recreation and play at the quiet end and will be tolerable at the noisy end.)

NORMALLY UNACCEPTABLE:

The noise exposure is significantly more severe so that unusual and costly building constructions are necessary to ensure adequate performance of activities. (Residential areas: barriers must be erected between the site and prominent noise sources to make the outdoor environment tolerable.)

CLEARLY UNACCEPTABLE:

The noise exposure at the site is so severe that construction costs to make the indoor environment acceptable for performance of activities would be prohibitive. (Residential areas: the outdoor environment would be intolerable for normal residential use.)

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D. City of El Paso de Robles

1. Goal

It is the goal of the City of El Paso de Robles to ensure that its residents are free from excessive noise and abusive sounds. Primary emphasis should be placed on protecting the general public from noise levels which may be hazardous to hearing. Secondary emphasis should be the minimization of noise induced stress, annoyance, and activity interference.

2. Policies

- 1.0 Establish land use noise compatibility standards for general planning and zoning purposes.
- 2.0 Provide for the identification and evaluation of potential noise problem areas.
- 3.0 Reduce existing and potential incompatible noise levels in problem areas through land use strategies, building and subdivision code enforcement, and other administrative means.
- 4.0 Reduce existing and potential incompatible noise levels in problem areas through operational or source controls where the City has responsibility for such controls.
- 5.0 Provide for the education of the community in the nature and extent of noise problems in the City.
- 6.0 Coordinate noise control activities with those of other responsible jurisdictions.
- 7.0 Provide for periodic review and revision of the Noise Element.

3. Implementation Measures

1.0 Establish land use noise compatibility standards for general planning and zoning purposes

- 1.1 Adopt the noise compatibility standards provided in Figure 4 for use in identifying potential noise problem areas, and in reviewing environmental impact documents.
- 1.2 Develop a zoning ordinance setting specific noise limits for various land uses.

2.0 Provide for the identification and evaluation of potential noise problem areas

- 2.1 Using the noise compatibility standards provided in Figure 4, review existing land uses to identify potential noise problems.
- 2.3 Establish an on-going noise monitoring program to identify and evaluate noise levels in the City.

3.0 Reduce existing and potential incompatible noise levels in problem areas through land use strategies, building and subdivision code enforcement, and other administrative means

- 3.1 Discourage development of noise sensitive uses in incompatible noise-impacted areas close to major noise sources.
- 3.2 Strictly enforce all existing noise control regulations, including building and subdivision laws.
- 3.3 In existing or future development in noise-impacted areas, encourage or require through ordinance that adequate site planning and insulation measures are taken to reduce noise to the established levels.

- 3.4 Continue efforts to acquire the two farm houses impacted by air/traffic noise as identified in the Master Plan for Paso Robles Municipal Airport.
- 4.0 Reduce existing and potential incompatible noise levels in problem areas through operational or source controls where the City has responsibility for such controls
- 4.1 Locate routes for use by heavy trucks away from noise sensitive land uses.
- 4.2 Encourage the Southern Pacific Transportation Company to control its operations to reduce noise impacts on the community.
- 4.3 Require noise abatement by stationary sources in cases of excessive noise emissions.
- 5.0 Provide for the education of the community in the nature and extent of noise problems in the City
- 5.1 Develop an information release program to familiarize residents of Paso Robles with the Noise Element and noise problems in general. Special attention should be paid to identifying and informing those people now residing or working in noise problem areas.
- 5.2 Provide developers and builders with specific design information to reduce noise levels in new and existing developments. Consult with developers during the permit application process regarding potential noise problems.
- 5.3 Maintain a noise information library for both the general public and those with technical backgrounds involved in noise control.



6.0 Coordinate noise control activities with those of other responsible jurisdictions

- 6.1 Encourage the State Department of Transportation (CALTRANS) and the County Engineer to incorporate noise reduction methods in new and existing road construction.
- 6.2 Coordinate noise monitoring activities with those of the County and CALTRANS.
- 6.3 Encourage the development and use of a uniform noise evaluation scheme at all levels of government.

7.0 Provide for periodic review and revision of the Noise Element

- 7.1 The Noise Element should be reviewed at least every two years and should be comprehensively revised every five years or whenever major changes in the noise environment occur.
- 7.2 Upon adoption of the Noise Element, a review committee should be established to oversee its implementation and to report to the City Council on implementation progress. This committee should be composed of representatives from the Planning Department, the City Engineer, and the general public.
- 7.3 The Noise Element should be reviewed when revisions or preparation of the following plans or elements occur: Airport Land Use Plan, Land Use Element, Circulation Element, Housing Element.

